

MEASURING OUTGASSING AND IMPACT EVENTS FROM THE LUNAR SURFACE

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ABSTRACT

Recent efforts to explore the Moon include a push to understand and characterize the lunar atmosphere. This surface boundary exosphere has a surface density of 10^5 cm^{-3} , and total components, their origin and dynamics are poorly understood. Contributing to this atmosphere are such events as solar wind bombardment and comet and meteor impacts, which release volatiles from the impactor, surface and near interior. In addition, transient outgassing events, lasting up to tens of minutes and contributing many tons of gases from the deep lunar interior, have been observed throughout history from Earth and lunar orbit (Crotts 2008). A number of these events have been observed to occur at the Aristarchus plateau, a leading site for future exploration. Thus, understanding the hazards and resources associated with transient lunar phenomena should be a high priority in lunar scientific studies.

We are developing a compact mass spectrometer that could measure volatiles from transient lunar phenomena and impact events, characterize the gas species, and determine their origin from one hundred kilometers distance. This instrument could easily be included on a range of landed platforms. Observing and describing these short-period events will help ascertain their contribution to the lunar atmosphere and determine their threat and benefit to future exploration. Such measurements should also be valuable on other airless bodies with known or potential internal activity, such as Io, Europa, and Enceladus.

Crotts, A. 2008. Lunar Outgassing, Transient Phenomena and the Return to the Moon, I: Existing Data, *Astrophysical Journal* 687, 692-705.